

19. (New) A composition as claimed in claim 17 wherein component a) is a polyvinyl alcohol .

20. (New) A process for forming starch polymer products which includes the steps of:

a) forming a mixture of starch, a modified starch, a water soluble polymer or copolymer containing vinyl alcohol units, up to 20 % of added water and a polyol plasticizer and 0.4 to 1.5 % by weight of a C₁₂₋₂₂ fatty acid or salt

b) working the mixture and forming a melt within the temperature range of 130° C to 160° C, and

c) reducing the temperature and further working the mixture and then extruding the mixture or injecting the mixture into a mould at a temperature of 85° C to 105° C without the need to remove water.

21. (New) A process for forming starch polymer products as claimed in claim 20 wherein the polymer is extruded into a sheet and subsequently thermoformed into a packaging tray.

Remarks

The Office Action and prior art relied upon have been carefully considered. In an effort to expedite the prosecution, claims 1-11 have been canceled and rewritten as new claims 12-21.

Claims 1 and 3-9 have been rejected under 35 USC §103(a) as obvious JP-8-325447 or JP-8-245836.

The JP '447 reference discloses biodegradable polymers that must include a modified starch that could include the specific modified starch defined in this invention. In addition the composition must include two other polymers namely 10 to 30% by weight of an ethylene vinyl alcohol polymer and 50 to 60 % of a polycaprolactone it also requires the use of glycerol and a fatty acid amide.

Polycaprolactone and ethylene vinyl alcohol are not water soluble polymers. The cost of the formulation is much greater than that of either of the formulations set out in paragraphs 9 and 10 of the attached Declaration because of the low content of starch and the high content of expensive polymers such as polycaprolactone. There is no suggestion that acceptable biodegradable polymers could be obtained by substituting starch for the polycaprolactone.

The JP'836 discloses a film formulation which may contain 5 to 80 % of a raw or modified starch 0.5% to 30% water and 4.4 to 49 % of an ethylene vinyl acetate copolymer or a polycaprolactone. Again both these polymers are not water soluble. The content range of water is much wider than proposed in the formulations of the invention and the inventor, in the attached Declaration state, that he does not believe that all of them would produce acceptable films. There is no explanation of what proportion of chemically modified starch should be used. The polymers proposed are all different to those listed in component b) and there is no suggestion that they could be substituted by water soluble polymers. There are such a large number of possible compositions and no explanation of how the components affect the properties, that it is impossible to say that there is any suggestion of the formula of paragraph 10 in the attached Declaration.

Claims 1-11 have been rejected under 35 USC §103(a) as unpatentable over Mayer (U.S. Pat. No. 5,322,866) in view of Tomka (U.S. Pat. No. 5,363,777).

Mayer discloses forming a blend of raw starch and 20 to 80% polyvinyl alcohol or ethylene vinyl alcohol and talc and combining that with a mixture of water and glycerol to produce blown films. The minimum quantity of polymer other than starch is greater than the maximum required in the formula given in paragraph of the attached Declaration. Although zinc and calcium stearates are used as nucleating agents they are disclosed as alternatives to talc. The processing requirements disclosed in Mayer use a minimum die temperature of 110° C (see examples 1 and 3) whereas the formulation of the present invention allows processing at die temperatures below 105° C.

Tomka discloses a high temperature process for processing starch. The starch material used may include chemically modified starch. An important requirement is that no water is added to the starch. Tomka processes the starch at temperatures from 150° C to 300° C under conditions that have no water. As pointed out in column 12 Tomka eliminates foaming in the extruder by controlling water content and avoiding added water. There is no discussion or suggestion in Tomka as to the possibility of using chemically modified starches for processing at lower temperatures or in the presence of added water.

In paragraph 3 of the Office Action the Examiner states that the Japanese references disclose compositions that fall within the ranges claimed for the invention. As pointed out in paragraph 13 of the attached Declaration, the JP '447 reference also requires the use of a large proportion of polycaprolactone which is not a component of the formulation of the invention. The JP'836 reference also uses different non starch polymers, which are not water soluble, for blending.

Formulating polymer blends is not a simple process and it is not a routine matter to vary components within a formulation because it is difficult to predict what effect the changes will have on the functional properties and processing requirements of the formulation. As stated in the attached Declaration, it is and was not possible, at the time the invention was made, to predict what the consequence would be of changing the non water soluble non starch polymers such as polycaprolactone in the formulations of the Japanese references to a water soluble polymer. It was also not possible to predict that smaller quantities of the non starch polymers would be viable.

In paragraph 4 of the Office Action the Examiner asserts that it would be obvious to combine the disclosure of Tomka that chemically modified starches could be used with the disclosure of Mayer. However a skilled polymer chemist would not combine these two disclosures. Tomka clearly states that water is to be eliminated and not added whereas Mayer does allow for the addition of water. Neither reference teaches that the formulations could be processed at lower

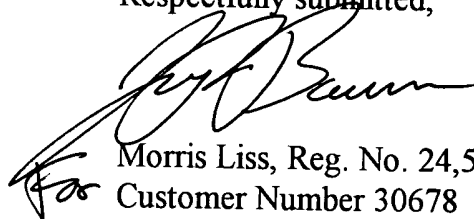
temperatures and be used in extruders with die temperatures in the range of 85° to 105° C. Further neither references teach the use of a modified starch could allow the amount of non starch polymer to be reduced and thus reduce the cost of the formulations.

For the reasons set forth above new claims 12-21 are believed to be allowable.

In the event the Examiner believes an interview might serve to advance the prosecution of this application in any way, the undersigned attorney is available at the telephone number noted below.

The Director is hereby authorized to charge any fees, or credit any overpayment, associated with this communication, including any extension fees, to CBLH Deposit Account No. 22-0185.

Respectfully submitted,



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